

Notice of Allowability

Application No.

10/034,602

Examiner

Tuan V. Thai

Applicant(s)

MARTIN ET AL.

Art Unit

2186

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Examiner interview conducted 01/29/2005.
2. ☒ The allowed claim(s) is/are 1-2, 5-15, 18-28, 31-41 and 44 renumbered as 1-36 respectively.
3. ☒ The drawings filed on 25 March 2002 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date 12/28/01
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date 01/21/2005.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

TUAN V. THAI
PRIMARY EXAMINER

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Attorney's Docket No.: 2001-055-SFT

IN THE UNITED STATES PATENT AND
TRADEMARK OFFICE

In re application of: Martin et al. Group: 2186
Serial No.: 10/034,602 Examiner: Tuan Thai
For: **DATA MANAGEMENT APPLIANCE.**

1. This action is responsive to Examiner interview conducted on January 19, 2005. Claims 3-4, 16-17, 29-30 and 42-43 have been canceled. Claims 1-2, 5-15, 18-28, 31-41 and 44 are now allowed.

EXAMINER'S AMENDMENT

2. An Examiner's Amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 C.F.R. § 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the Issue Fee.

3. Authorization for this Examiner's Amendment was given in a telephone interview with Mr. Timothy Schulte; Reg. No. 29,013 on January 19, 2005.

4. The application has been amended as follows:

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a. In the claims:

a1. Please cancel claims 3-4, 16-17, 29-30 and 42-43.

a2. Please amend claims **1, 14, 27 and 40** as follow:

Claim 1. (amended) A method comprising:

attaching a first physical extent list to a node within a tree data structure, wherein the first physical extent list contains at least one entry, the at least one entry contains a first logical address range and a starting physical address, the node has a first key, and the first key is a second logical address range, whereby a mapping relation that maps logical addresses into physical addresses on at least one storage device is achieved[.];

wherein the second logical address range corresponds to a portion of a physical copy of a storage volume;

wherein the physical copy of the storage volume is a mirror-in-the-middle (MIM).

Claim 14. (amended) A computer program product in a computer readable medium comprising functional descriptive material that when executed by a computer enables the computer to perform acts including:

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attaching a first physical extent list to a node within a tree data structure, wherein the first physical extent list contains at least one entry, the at least one entry contains a first logical address range and a starting physical address, the node has a first key, and the first key is a second logical address range, whereby a mapping relation that maps logical addresses into physical addresses on at least one storage device is achieved[.];

wherein the second logical address range corresponds to a portion of a physical copy of a storage volume;

wherein the physical copy of the storage volume is a mirror-in-the-middle (MIM).

Claim 27. (amended) A data management appliance comprising:

means for attaching a first physical extent list to a node within a tree data structure, wherein the first physical extent list contains at least one entry, the at least one entry contains a first logical address range and a starting physical address, the node has a first key, and the first key is a second logical address range, whereby a mapping relation that maps logical addresses into physical addresses on at least one storage device is achieved[.];

wherein the second logical address range corresponds to a portion of a physical copy of a storage volume;

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wherein the physical copy of the storage volume is a mirror-in-the-middle (MIM).

Claim 40. (amended) A computer readable medium encoded with a data structure, the data structure comprising:

a plurality of nodes; and

at least one physical extent list, wherein each of the plurality of nodes contains a plurality of pointers, wherein each of the plurality of pointers points to one of a node and a physical extent list, wherein each of the nodes represents a range of logical addresses, and wherein the at least one physical extent list contains entries and the entries represent addresses of physical extents stored on at least one storage device, whereby the data structure stores a mapping relation that maps logical addresses into physical addresses on at least one storage device[.];

wherein the range of logical addresses represents data that is stored on a physical copy of a storage device;

wherein the physical copy is a mirror-in-the-middle (MIM).

REASONS FOR ALLOWANCE

5. The following is an Examiner's Statement of Reasons for

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Allowance:

The prior art of record does not teach or suggest, alone or in combination, **all** the limitations of the amended independent claims of the current invention (claims 1, 14, 27 and 40) wherein the invention directs toward a data management appliance and ancillary technologies for replicating data written to a primary storage system, the data management appliance is a random-access storage system that at the logical block level replicates the contents of a primary storage system over time, a mirror-in-the-middle (MIM) included in the data management appliance is used to record an exact copy of the primary storage system at some fixed point in time. The prior art of record do not particularly teach a virtual recovery mapping object (VRMO) composed of a multi-way tree with plurality of nodes that connected to a physical extent list contains at least one entry, the at least one entry contains a first logical address range and a starting physical address; the node has a first key, and the first key is a second logical address range, the VRMO is used to map logical addresses at a particular point in time to their physical locations within the data management appliance, wherein the VRMOs act as an index, allowing for quick, random-access recovery of data, the VRMO also allows logical address translation in logarithmic time. In light of the foregoing, claims 1, 14, 27 and 40 of the present application are found to be patentable over the prior arts.

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Claims 2, 5-13, 15, 18-26, 28, 31-39, 41 and 44 further limit the allowable independent claims 1, 14, 27 and 40. These claims are therefore allowable for the same reason as set forth above.

Any comments considered necessary by Applicant must be submitted no later than the payment of the Issue Fee and, to avoid processing delays, should preferably accompany the Issue Fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tuan V. Thai whose telephone number is (571)-272-4187. The examiner can normally be reached on from 6:30 A.M. to 4:00 P.M..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mathew M. Kim can be reached on (571)-272-4182. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system,

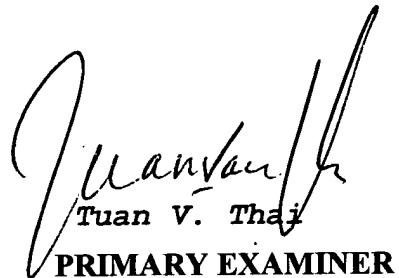
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see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TVT/January 19, 2005


Tuan V. Thai
PRIMARY EXAMINER
Group 2100